

Fig.1

| FLUORESCENT SUBSTANCE | RESPONSE SPEED | LUMINOUS INTENSITY |
|-----------------------|-------------------|-----------------------|
| P47 | × | ○ |
| GaN ILLUMINANT | × | ○ |
| GaAsP ILLUMINANT | ○ | △ |

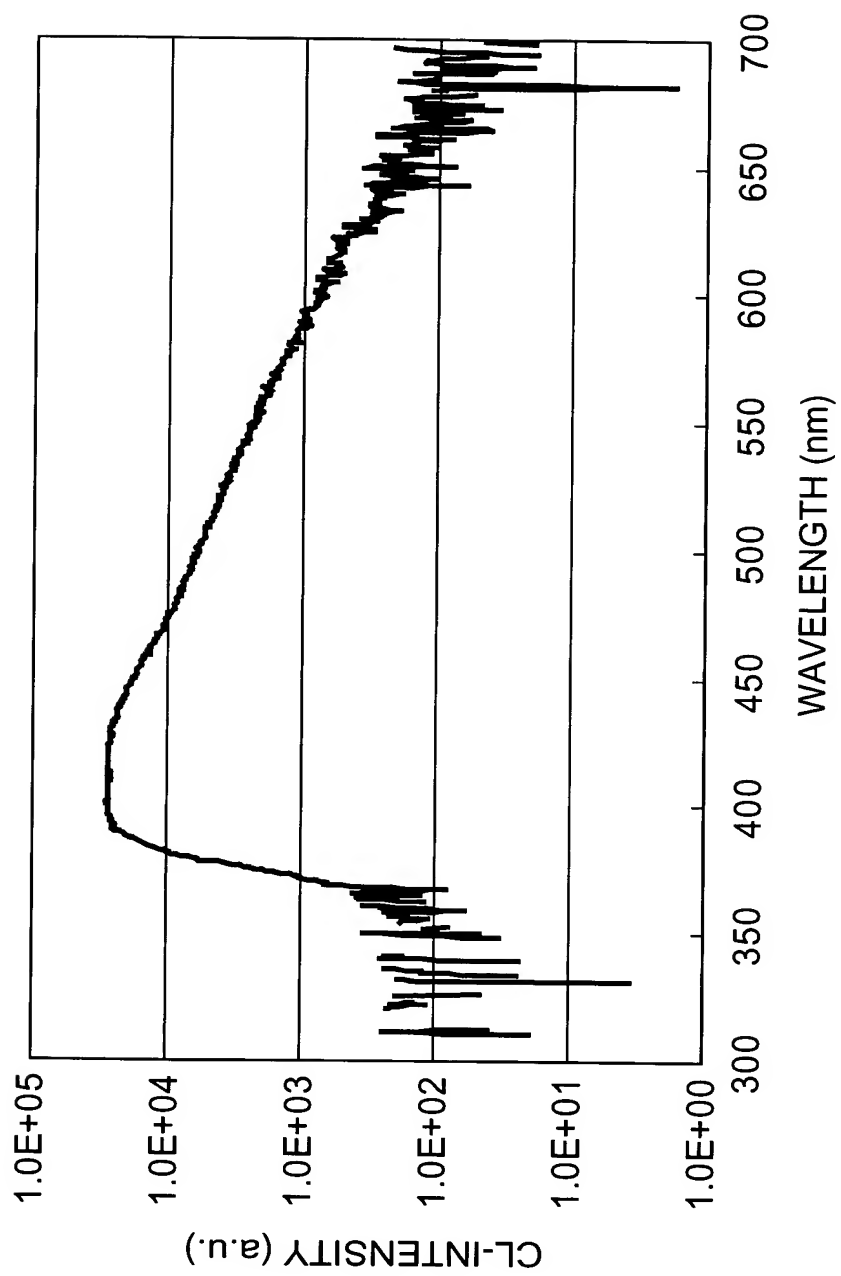
Fig.2

Fig.3A

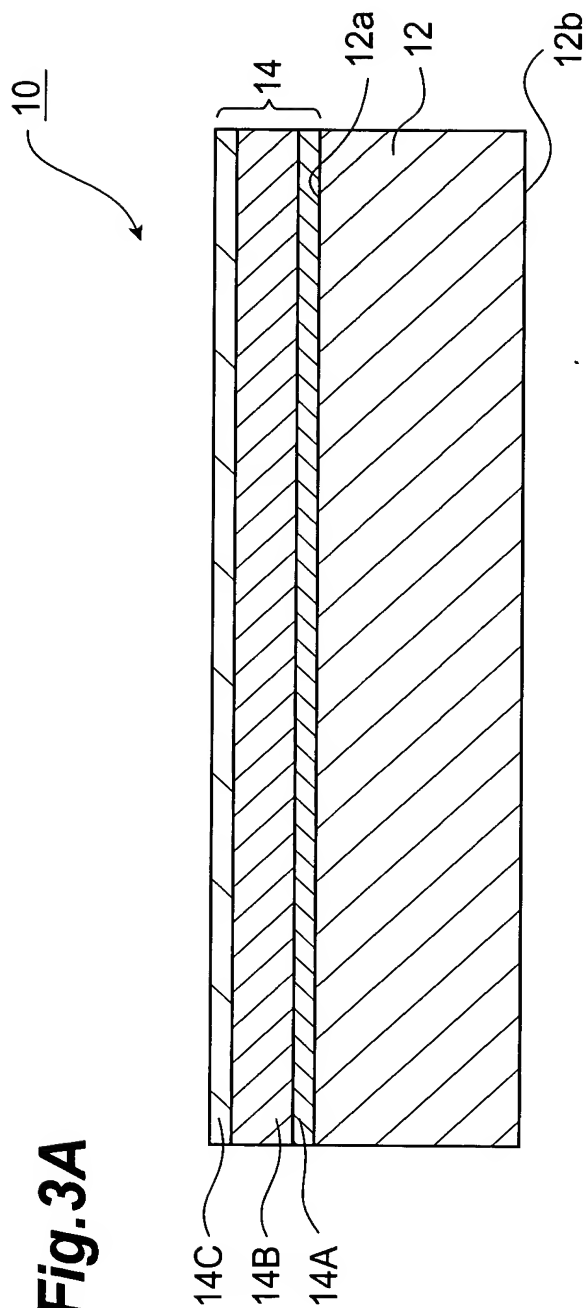


Fig.3B

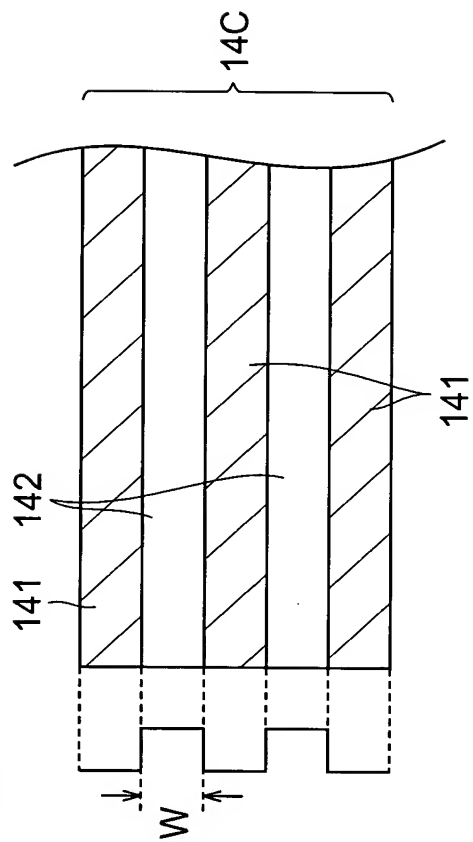
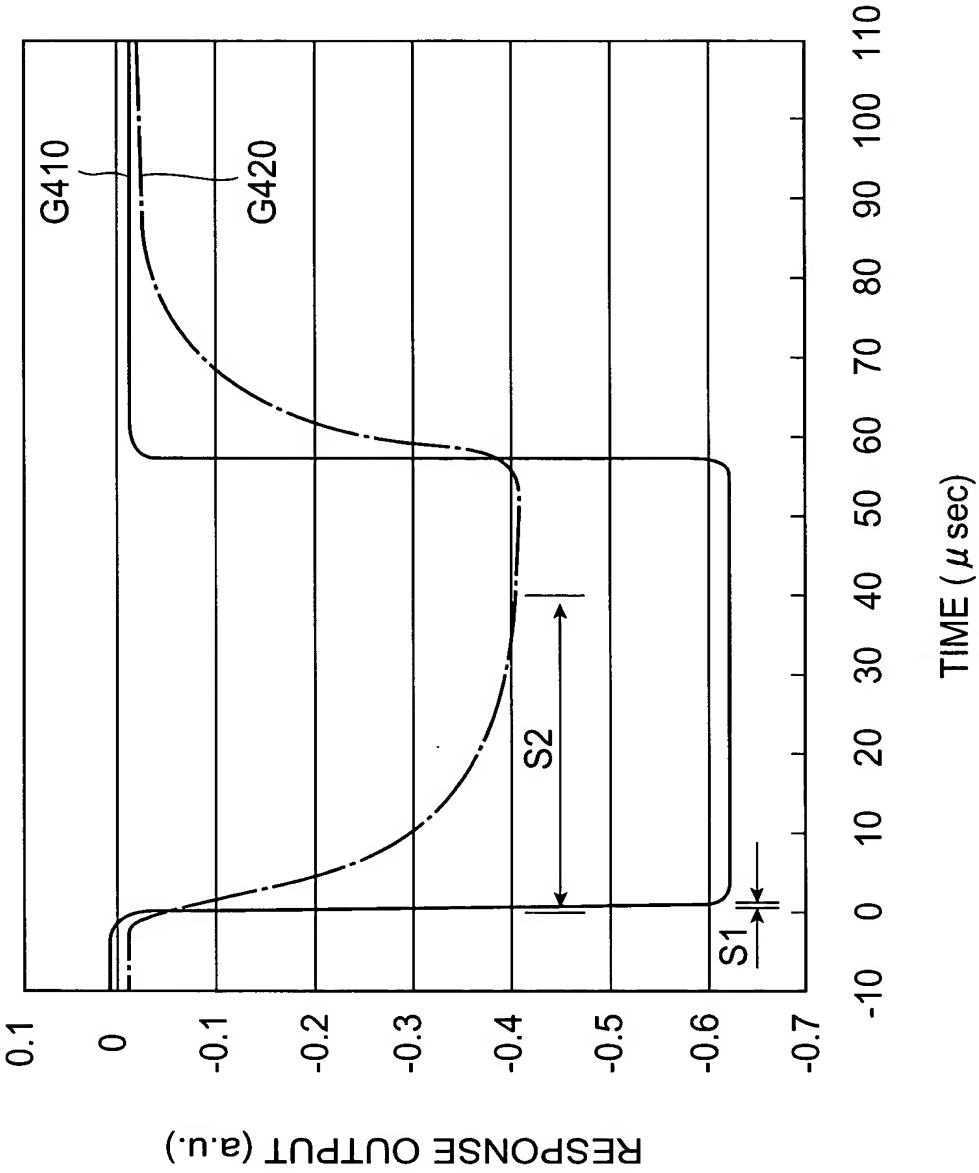
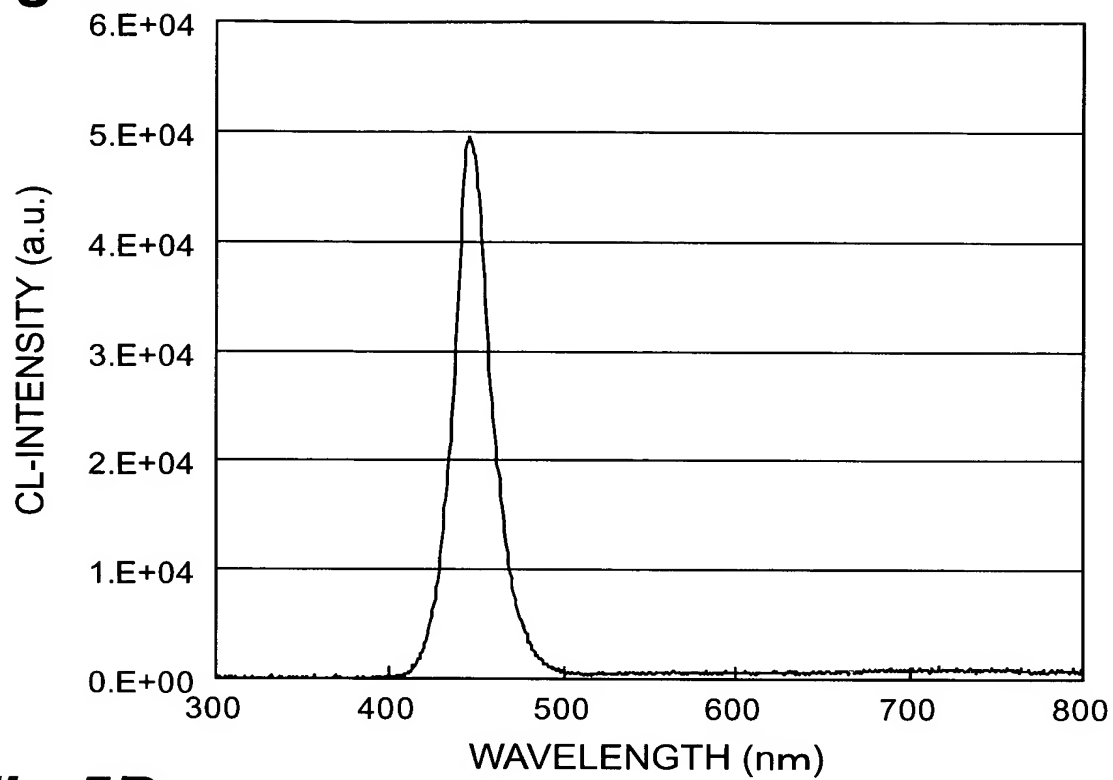
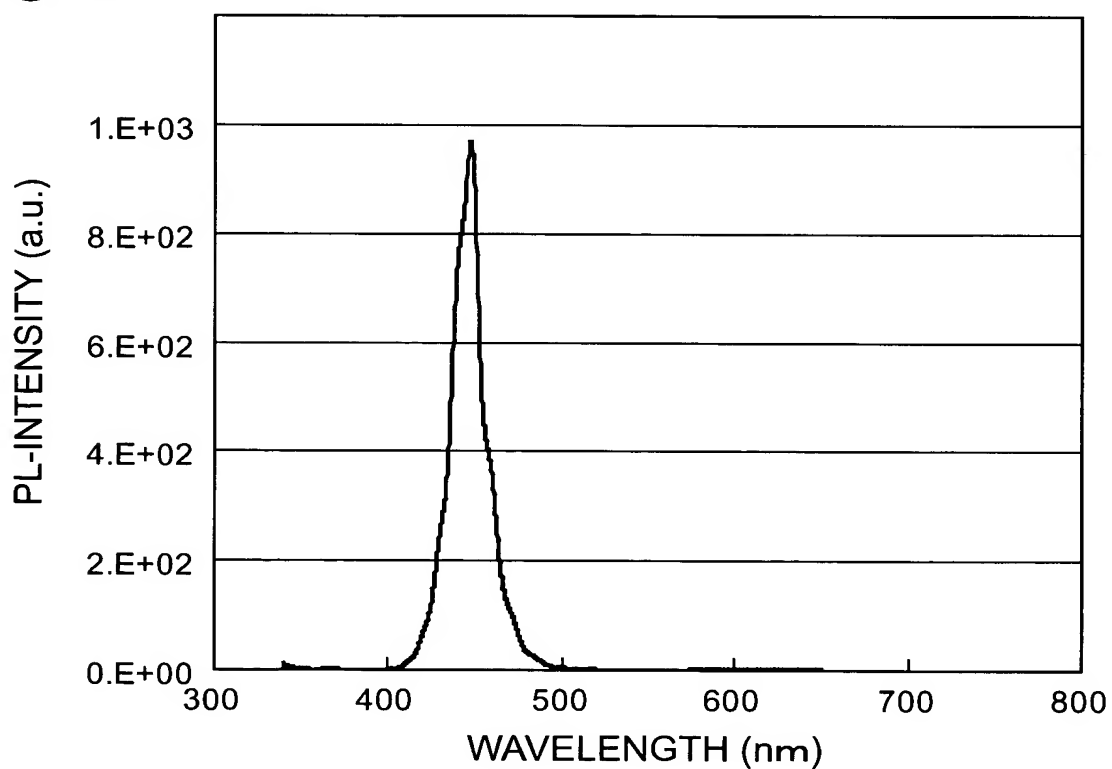


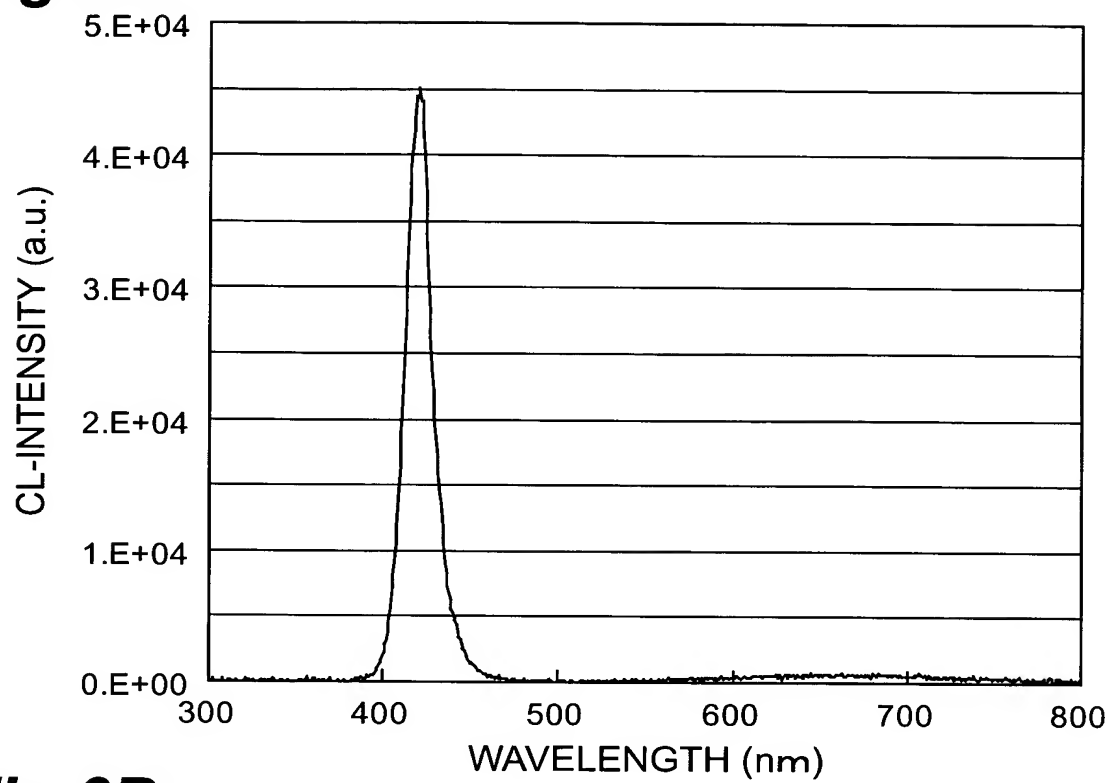
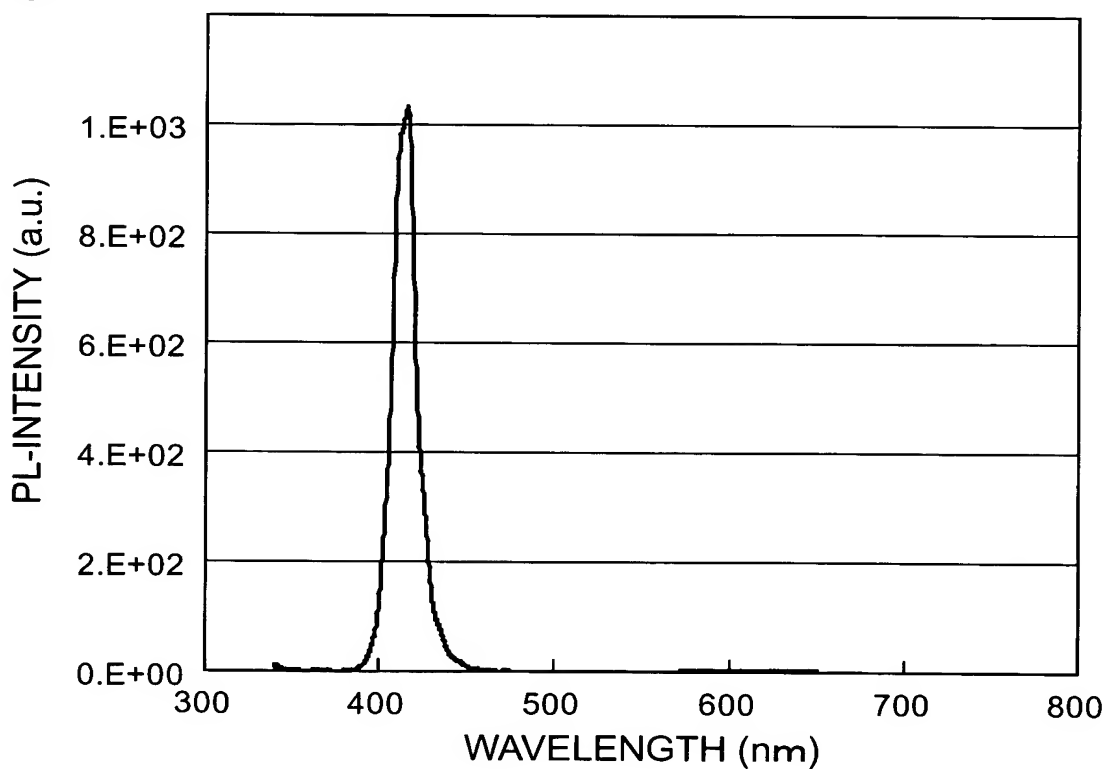
Fig.4



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Fig.5A**Fig.5B**

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Fig.6A**Fig.6B**

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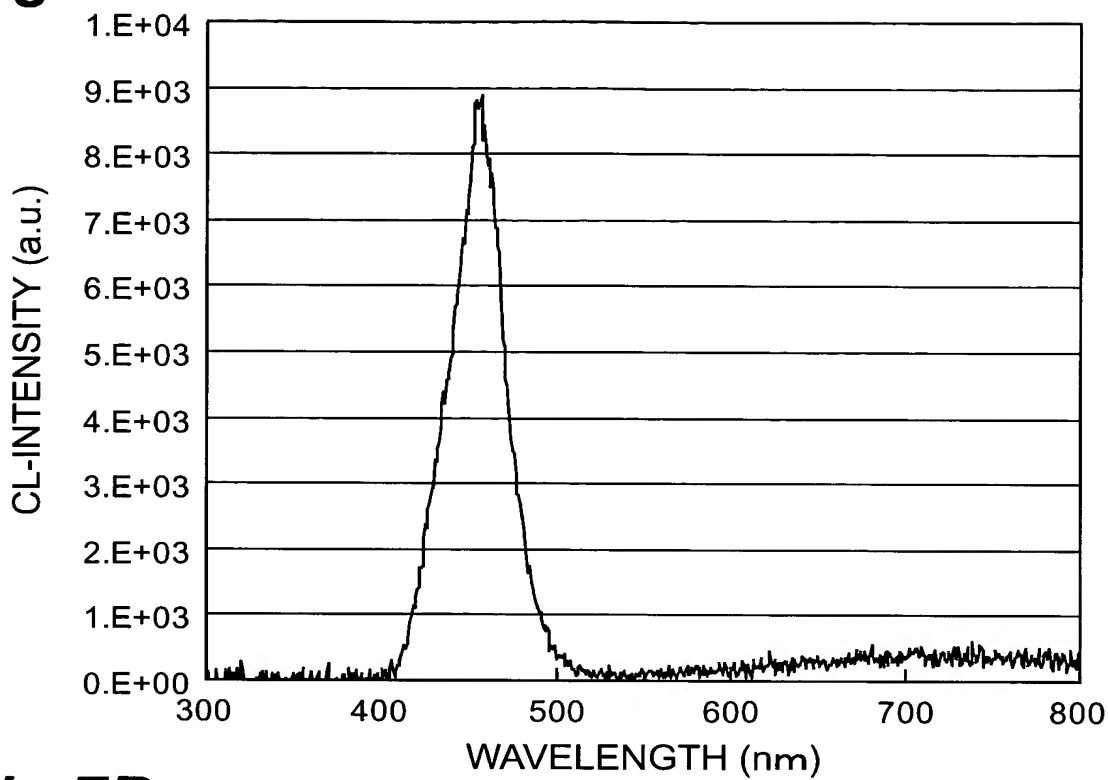
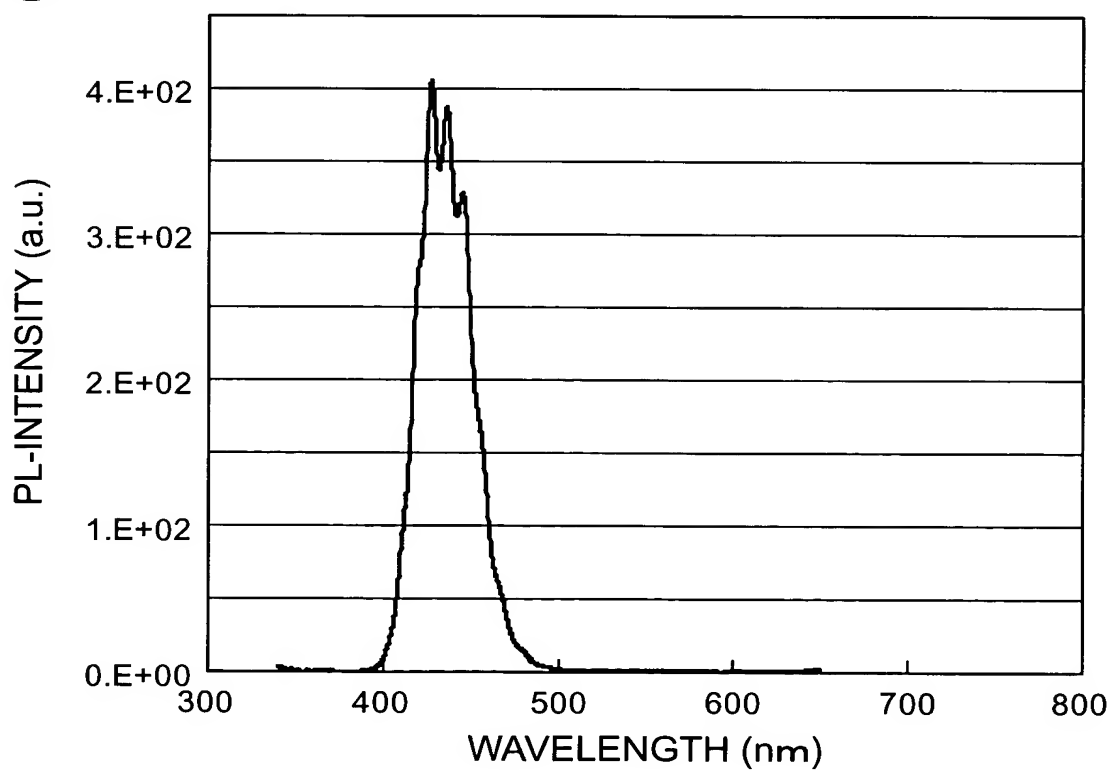
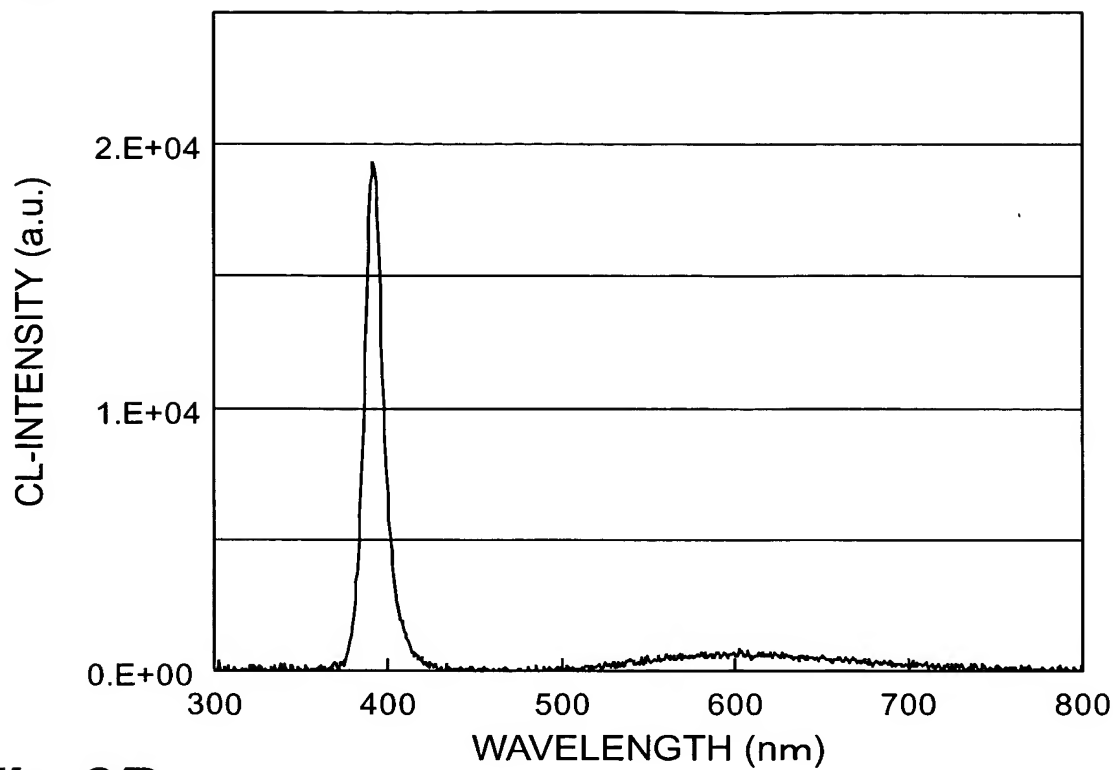
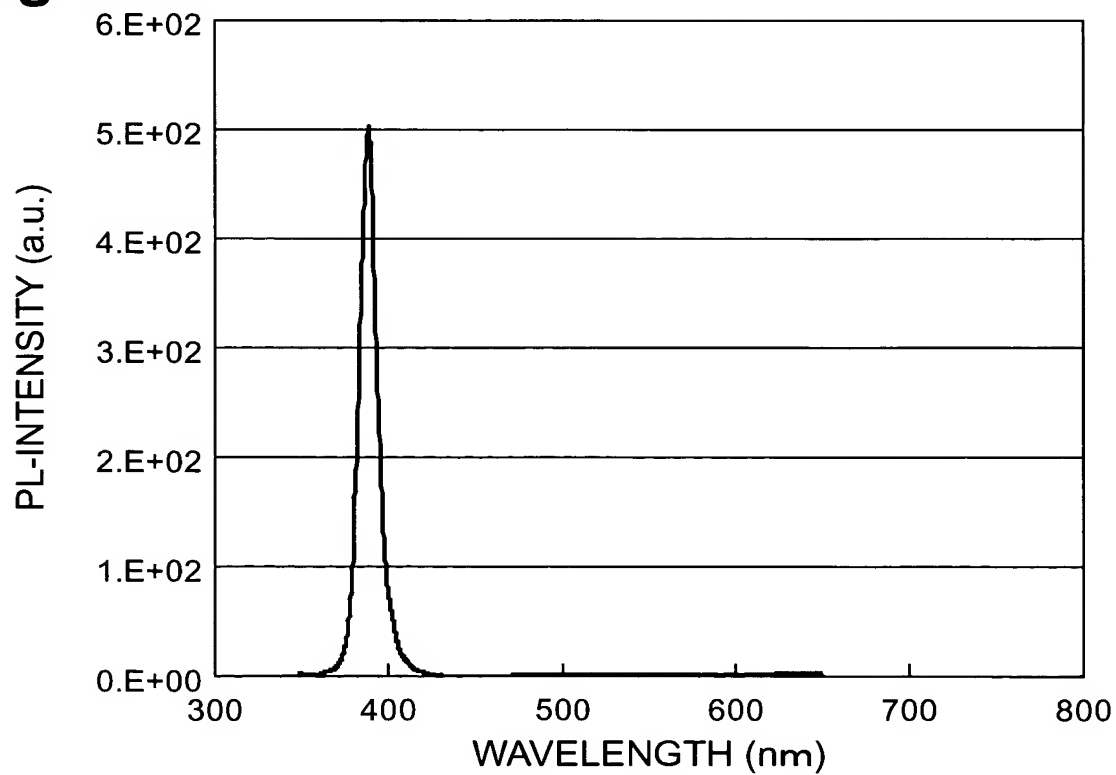
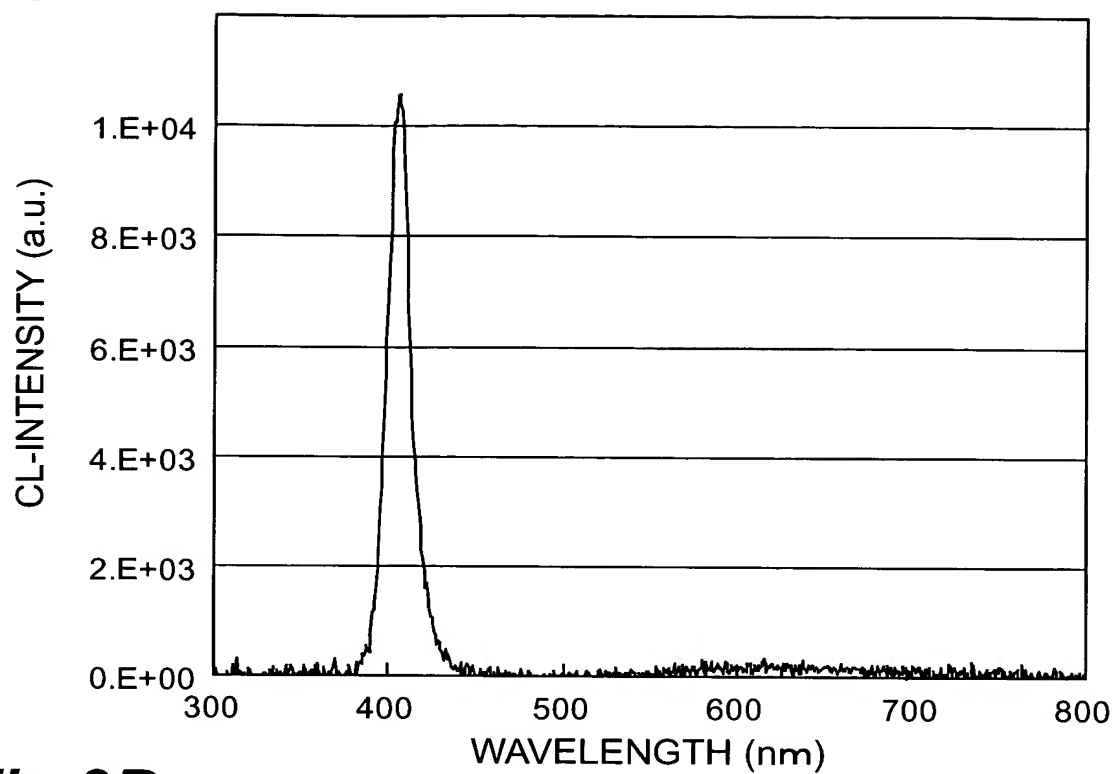
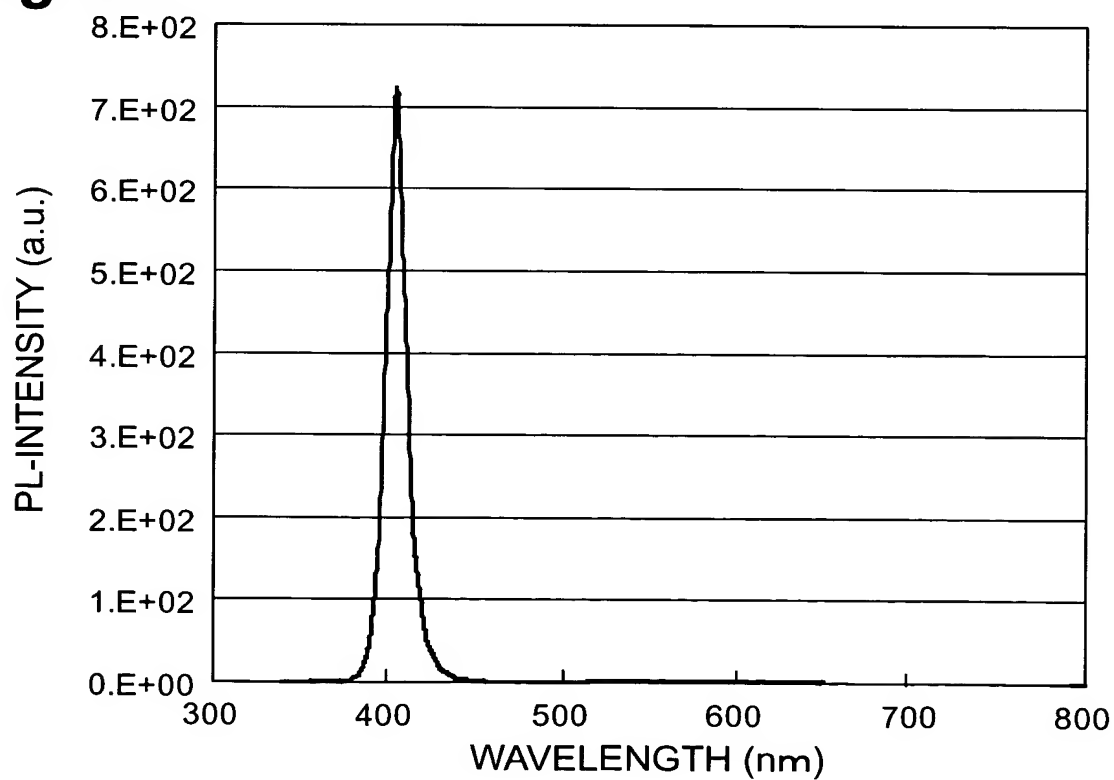
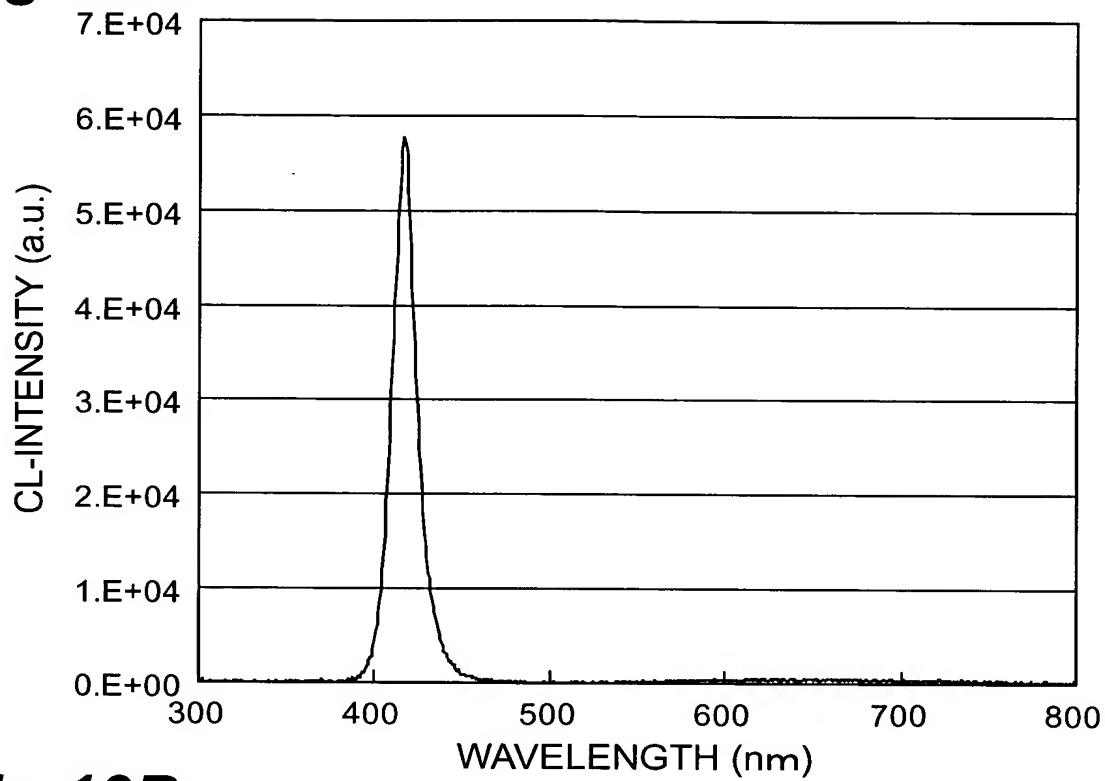
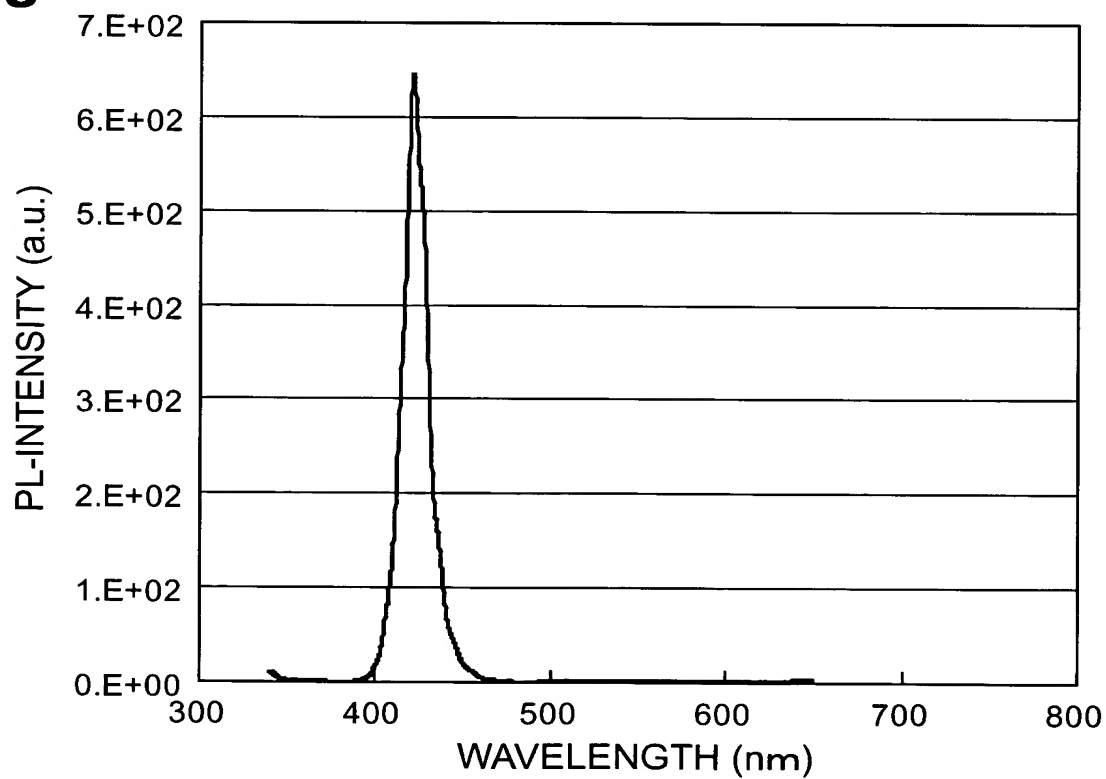
Fig.7A**Fig.7B**

Fig.8A**Fig.8B**

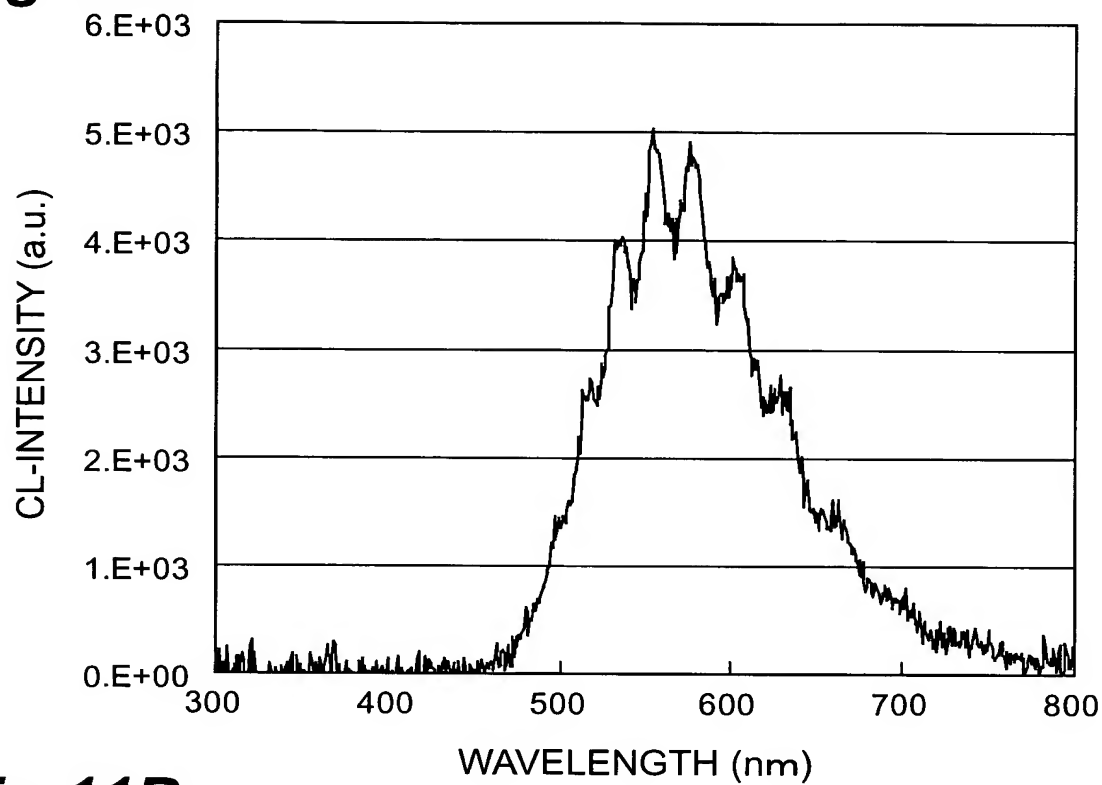
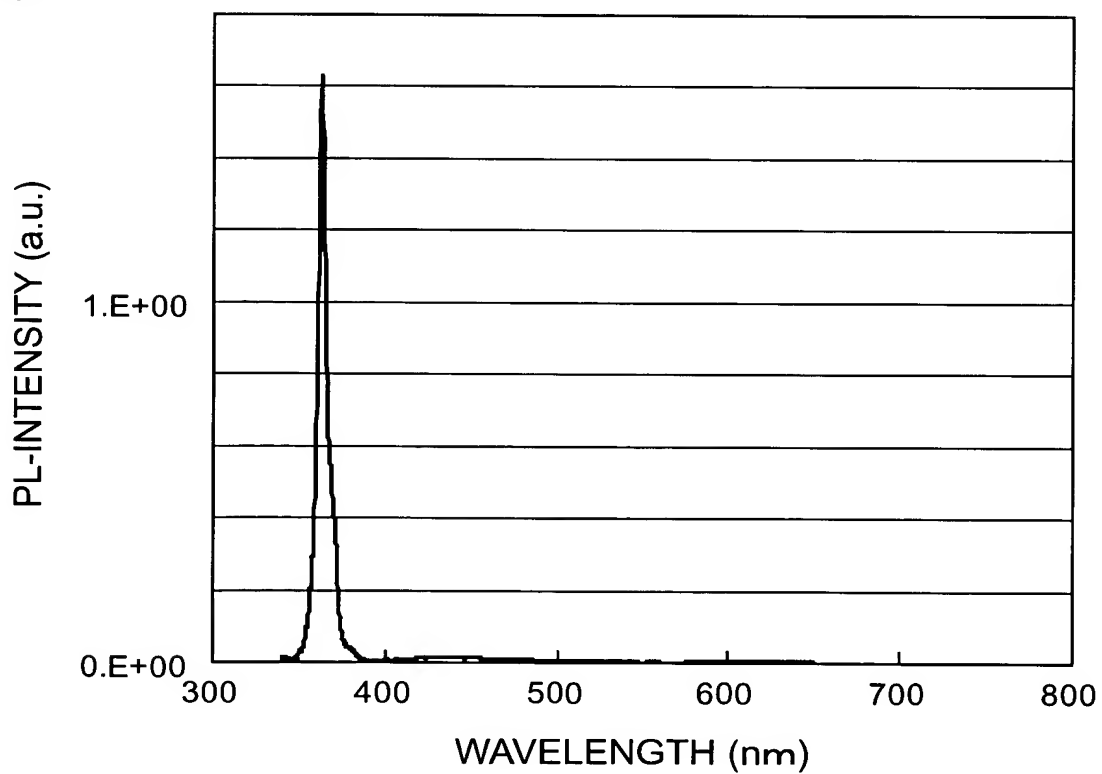
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Fig.9A**Fig.9B**

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Fig. 10A**Fig. 10B**

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Fig.11A**Fig.11B**

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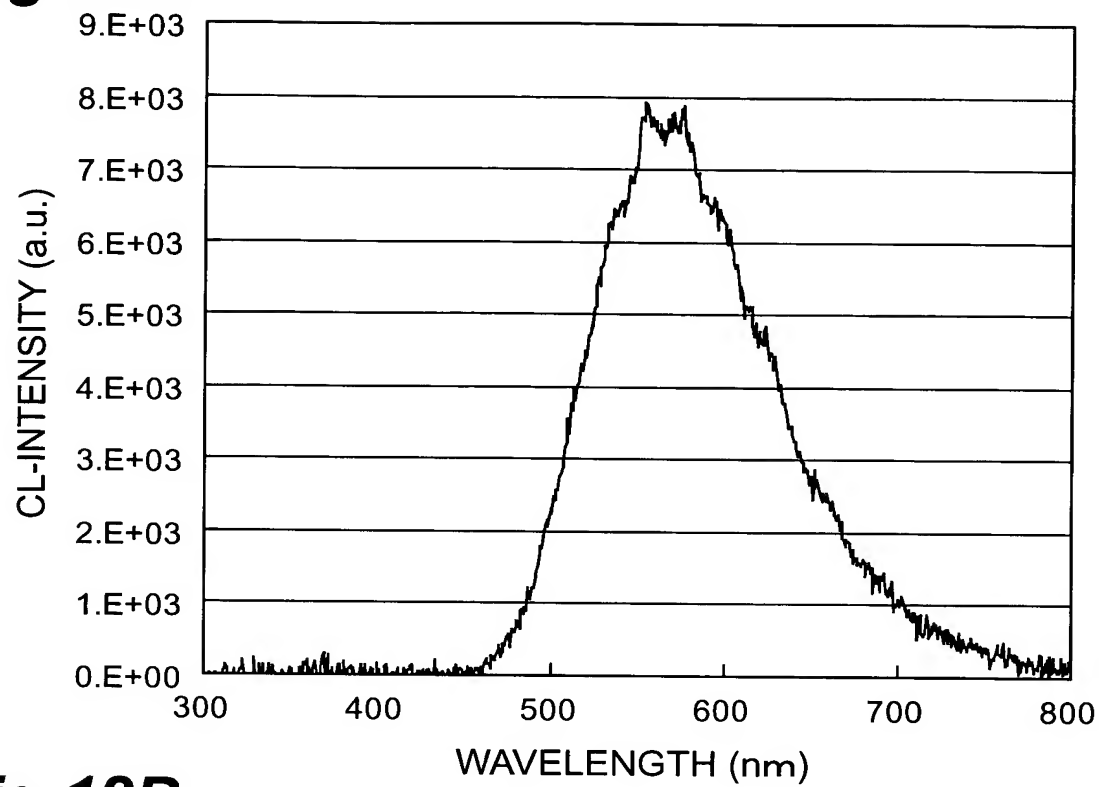
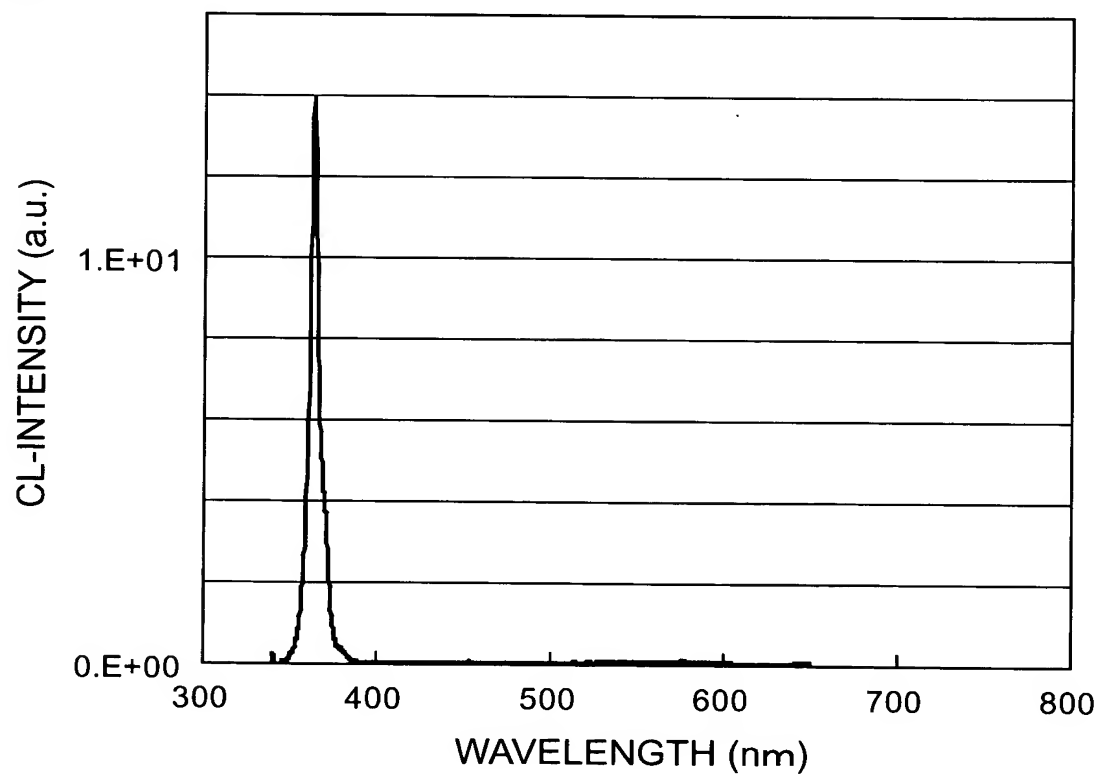
Fig.12A**Fig.12B**

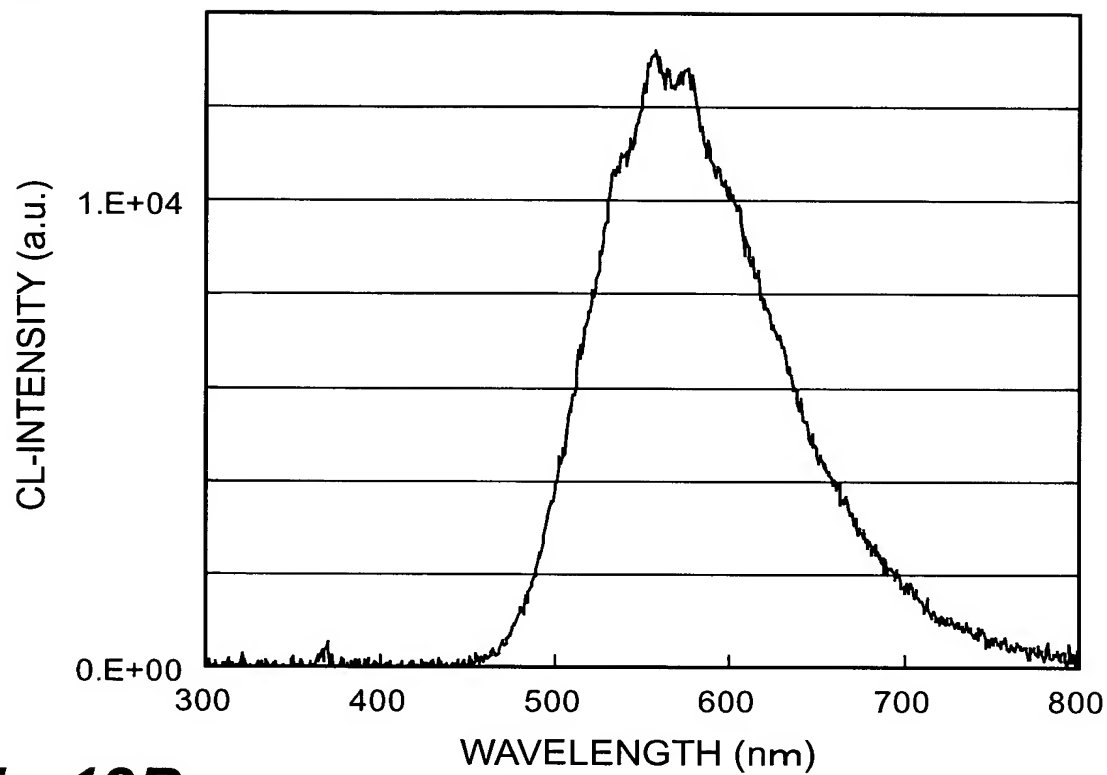
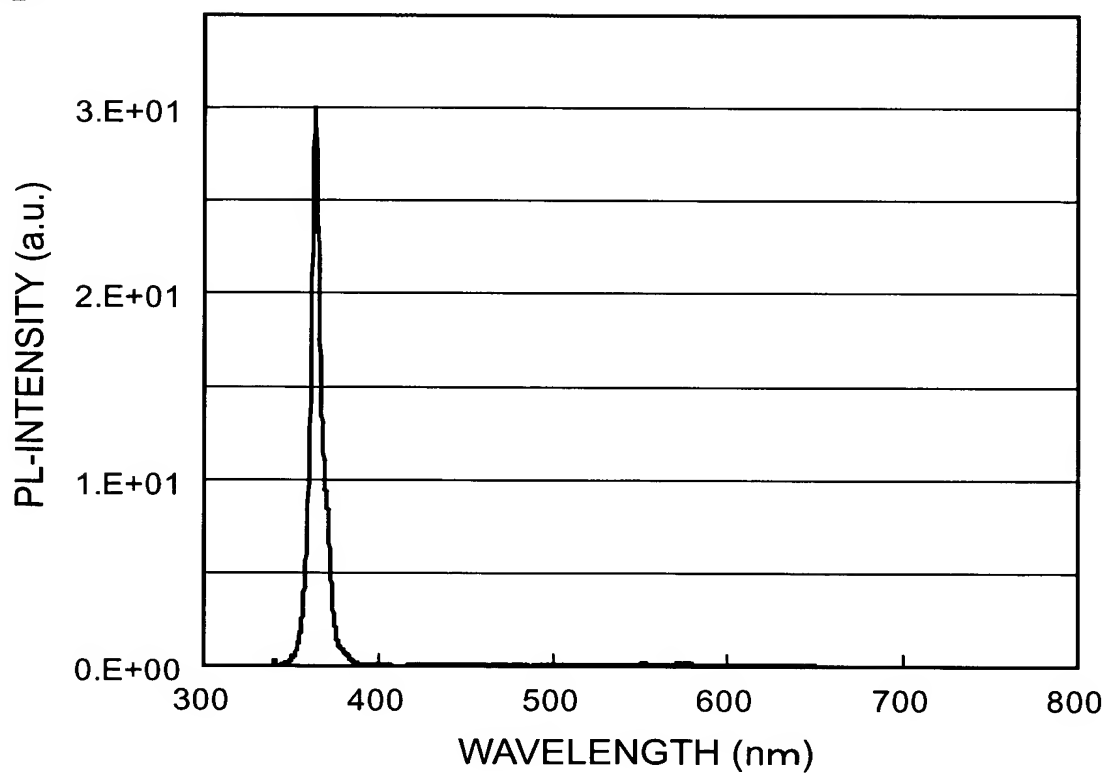
Fig.13A**Fig.13B**

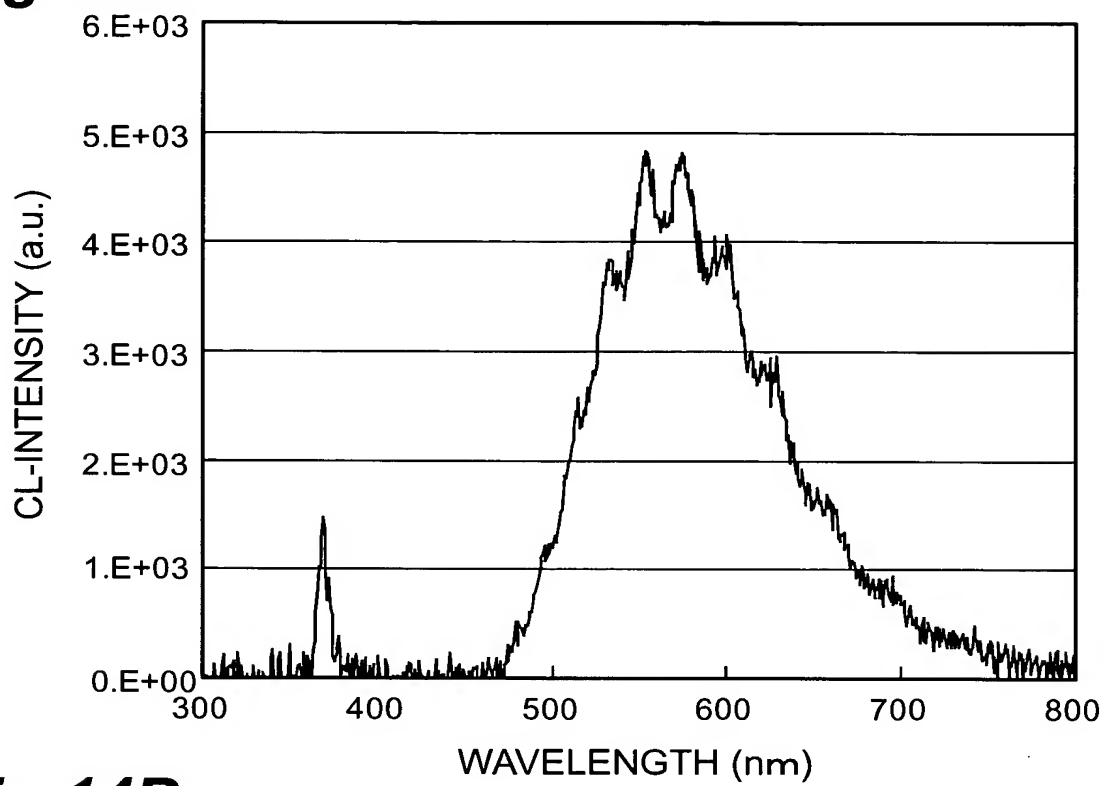
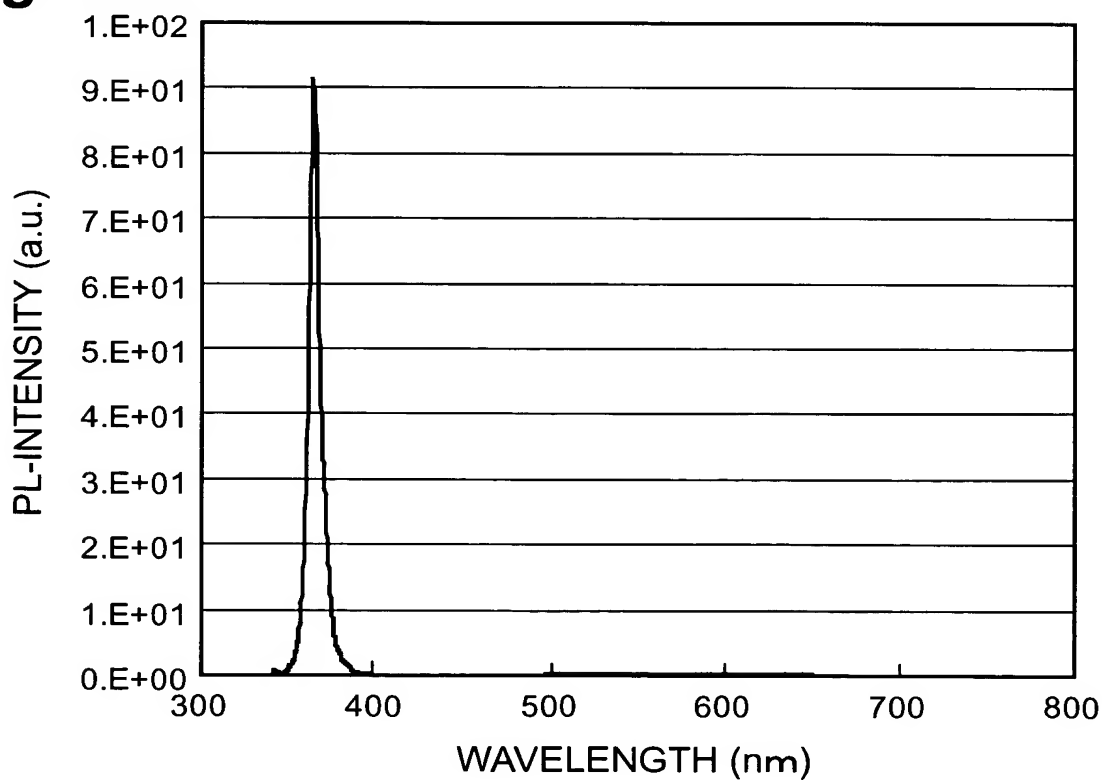
Fig.14A**Fig.14B**

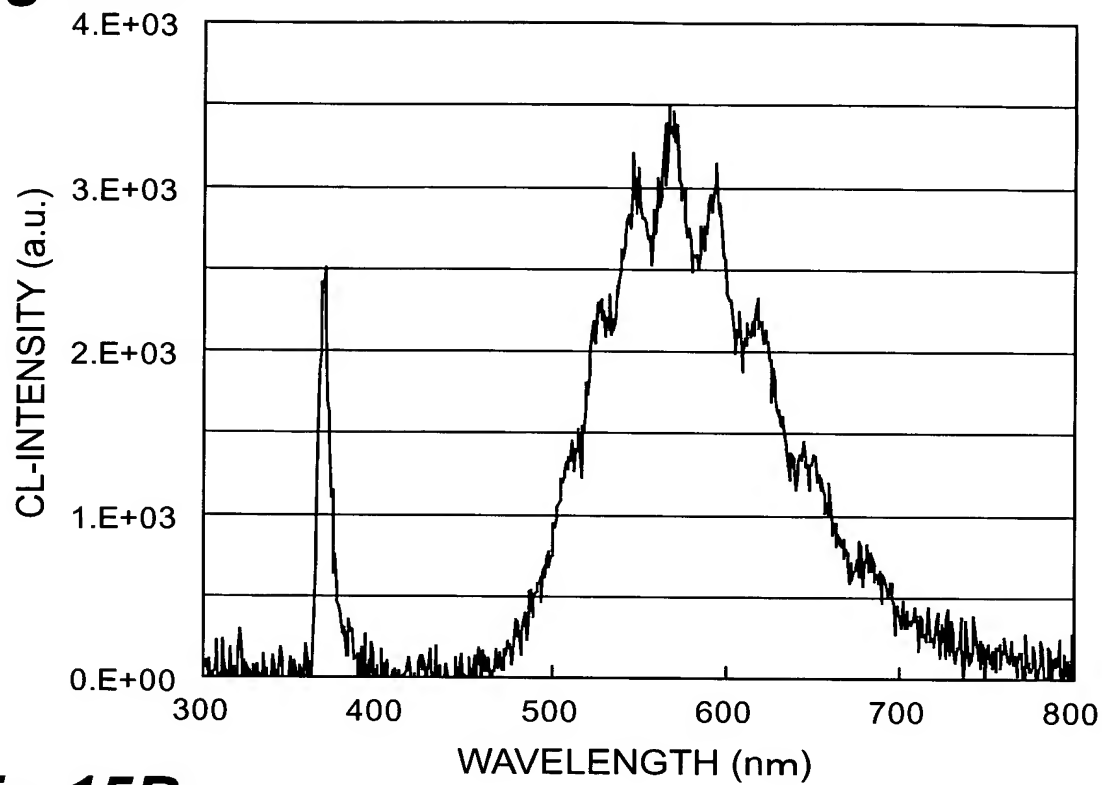
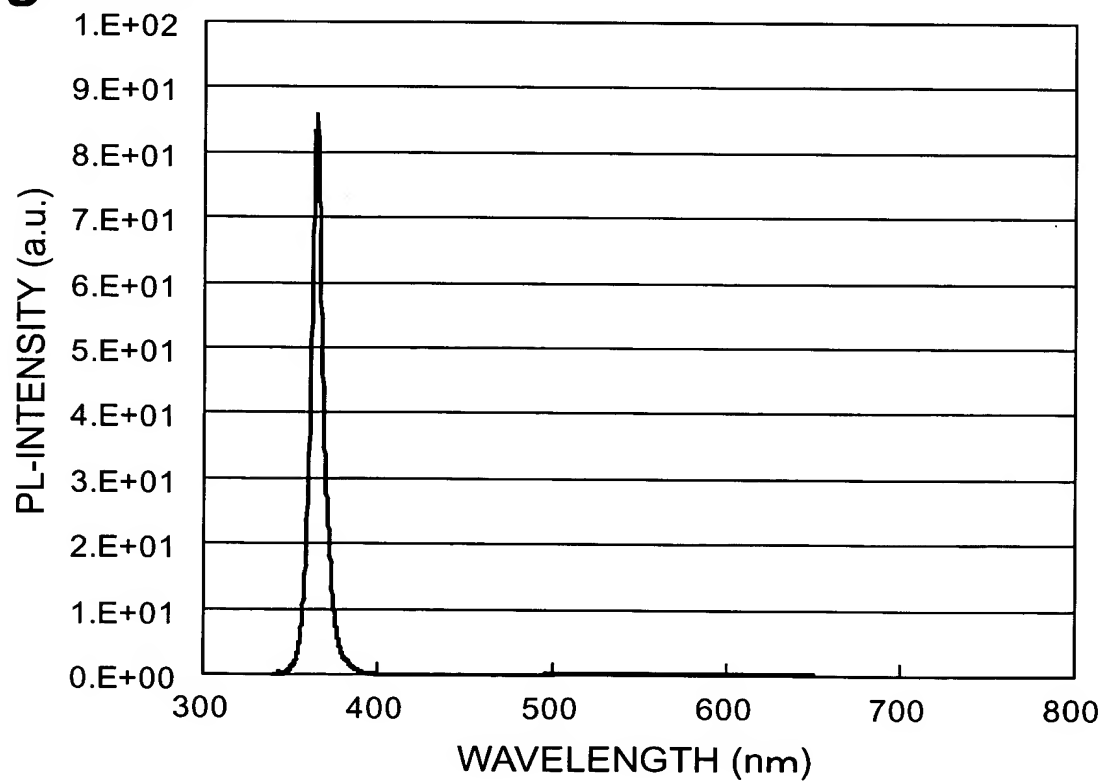
Fig. 15A**Fig. 15B**

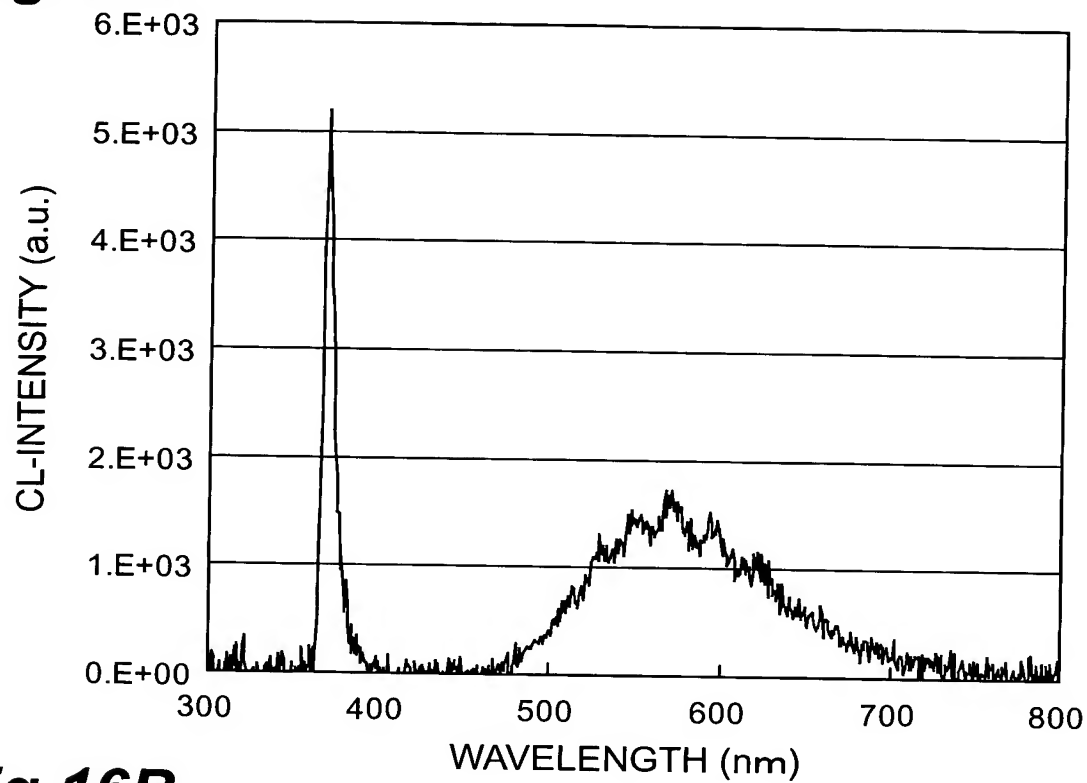
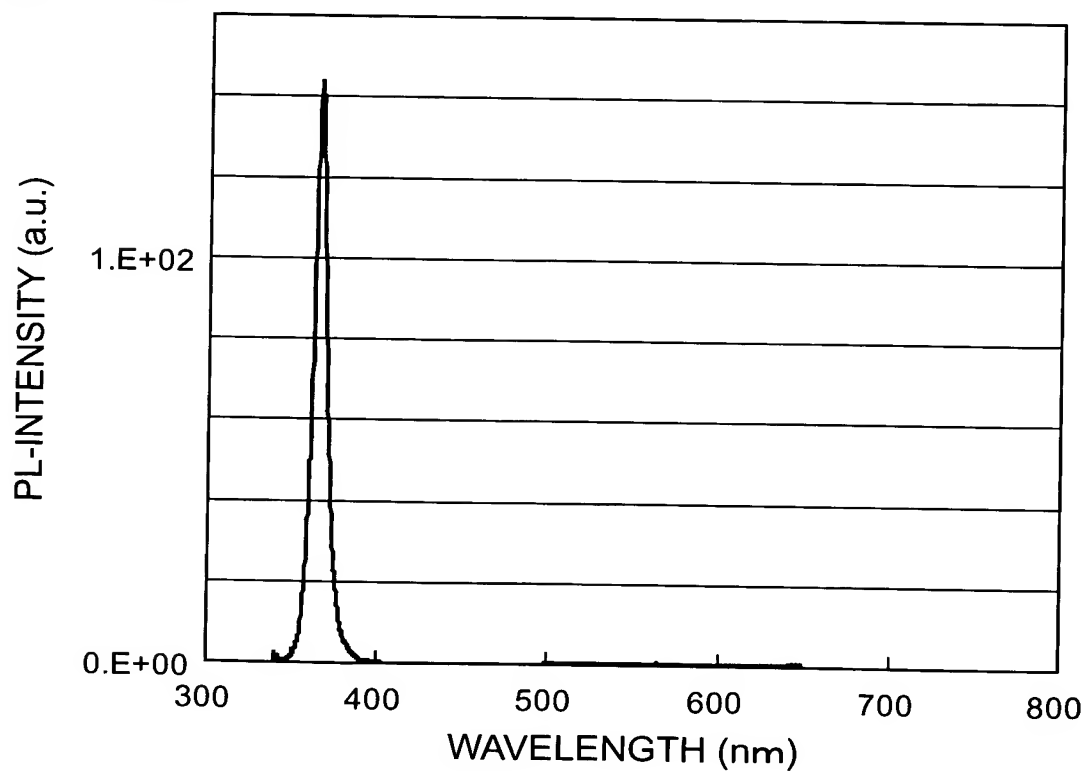
Fig.16A**Fig.16B**

Fig.17

| | TOP LAYER | WELL WIDTH (nm) | BARRIER LAYER THICKNESS (nm) | In- COMPOSITION (x) | Si-DOPANT AMOUNT (cm ⁻³) |
|--------------------------|------------------------------------|-----------------------|---------------------------------------|---------------------------|--|
| SAMPLE 1 | InGaN/GaN (QUANTUM WELL STRUCTURE) | 4 | 10 | 0.13 | 1.8×10^{18} |
| SAMPLE 2 | InGaN/GaN (QUANTUM WELL STRUCTURE) | 2 | 10 | 0.13 | 1.8×10^{18} |
| SAMPLE 3 | InGaN/GaN (QUANTUM WELL STRUCTURE) | 6 | 10 | 0.13 | 1.8×10^{18} |
| SAMPLE 4 | InGaN/GaN (QUANTUM WELL STRUCTURE) | 4 | 10 | 0.07 | 1.8×10^{18} |
| SAMPLE 5 | InGaN/GaN (QUANTUM WELL STRUCTURE) | 4 | 10 | 0.10 | 1.8×10^{18} |
| SAMPLE 6 | InGaN/GaN (QUANTUM WELL STRUCTURE) | 4 | 10 | 0.14 | 1.8×10^{18} |
| COMPARATIVE EXAMPLE 1 | GaN (BULK STRUCTURE) | — | — | — | 0 |
| COMPARATIVE EXAMPLE 2 | GaN (BULK STRUCTURE) | — | — | — | 1.4×10^{17} |
| COMPARATIVE EXAMPLE 3 | GaN (BULK STRUCTURE) | — | — | — | 2.8×10^{17} |
| COMPARATIVE EXAMPLE 4 | GaN (BULK STRUCTURE) | — | — | — | 1.4×10^{18} |
| COMPARATIVE EXAMPLE 5 | GaN (BULK STRUCTURE) | — | — | — | 2.8×10^{18} |
| COMPARATIVE EXAMPLE 6 | GaN (BULK STRUCTURE) | — | — | — | 6.8×10^{18} |

Fig.18

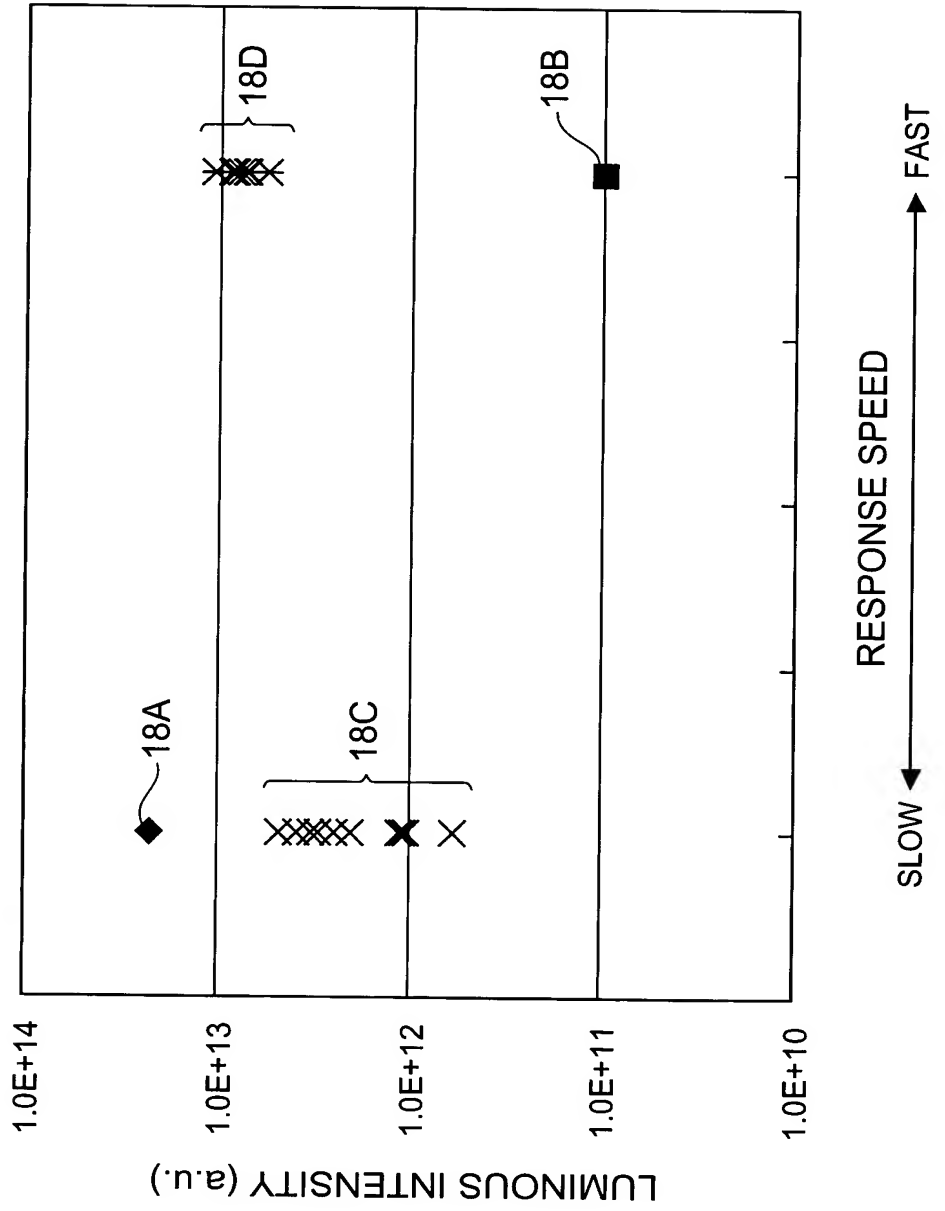


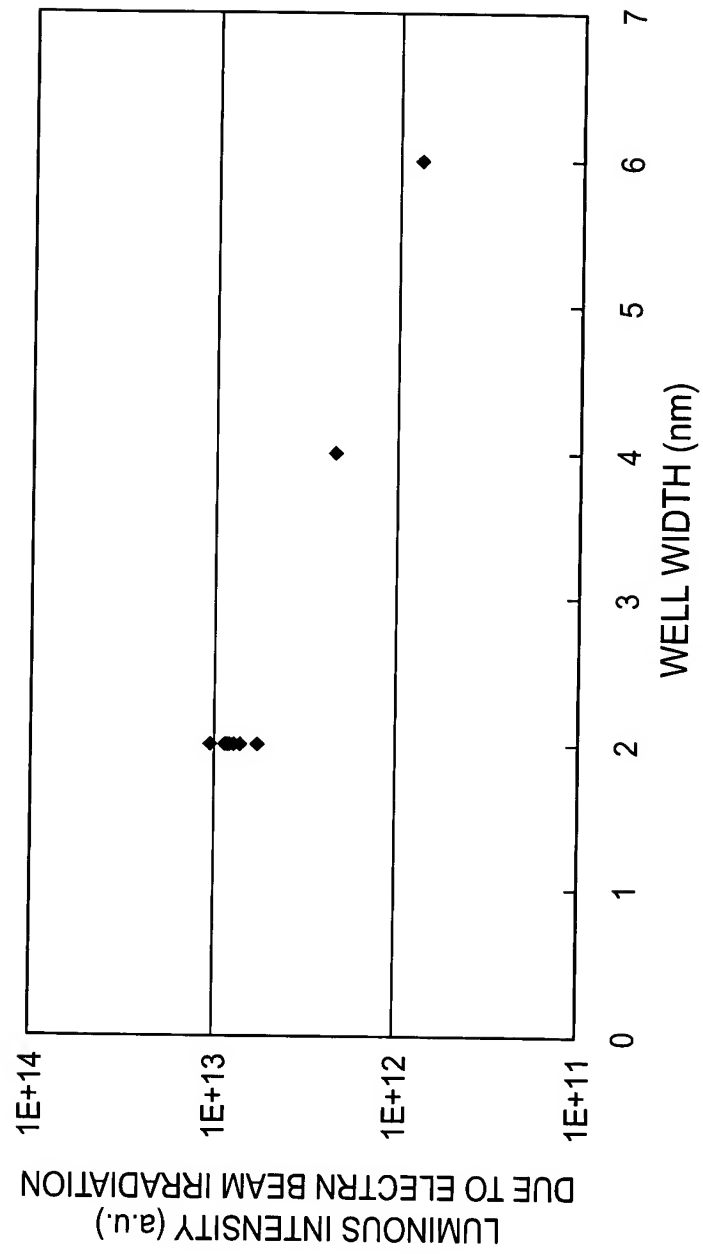
Fig.19

Fig.20

| SUBSTRATE MATERTIAL | TRANSMISSION WAVELENGTH (nm) | (eV) |
|---|---------------------------------|------|
| GaN | 366 | 3.39 |
| AlN | 200 | 6.2 |
| LiAlO ₂ (LAO) | 191 | 6.5 |
| LiGaO ₂ (LGO) | 221 | 5.6 |
| ZnO | 368 | 3.37 |
| 6H-SiC | 409 | 3.03 |
| 4H-SiC | 380 | 3.26 |
| α -Al ₂ O ₃ (SAPPHIRE) | 170 | — |
| MgO | 200 | — |
| MgAl ₂ O ₄ | 200 | — |

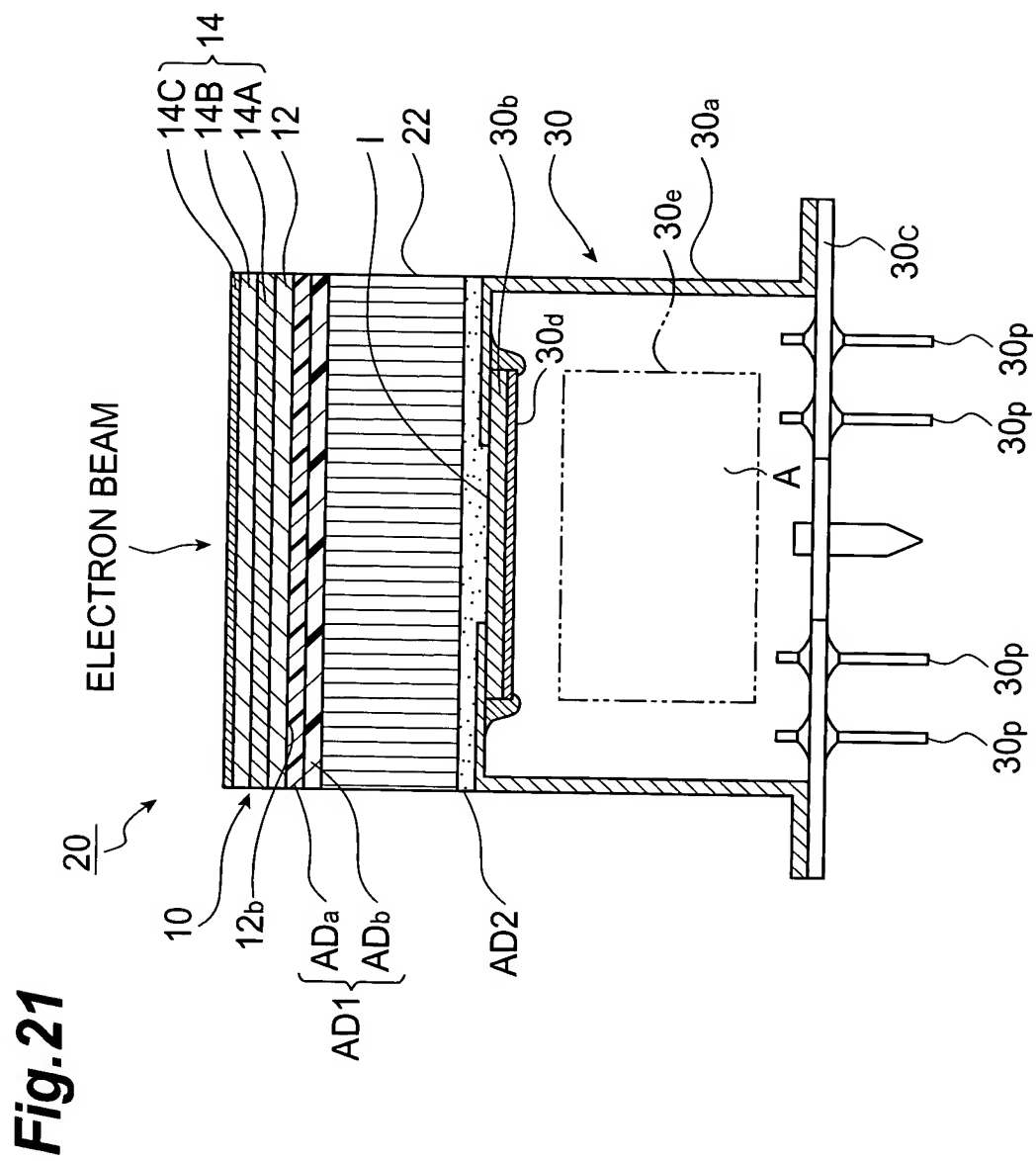


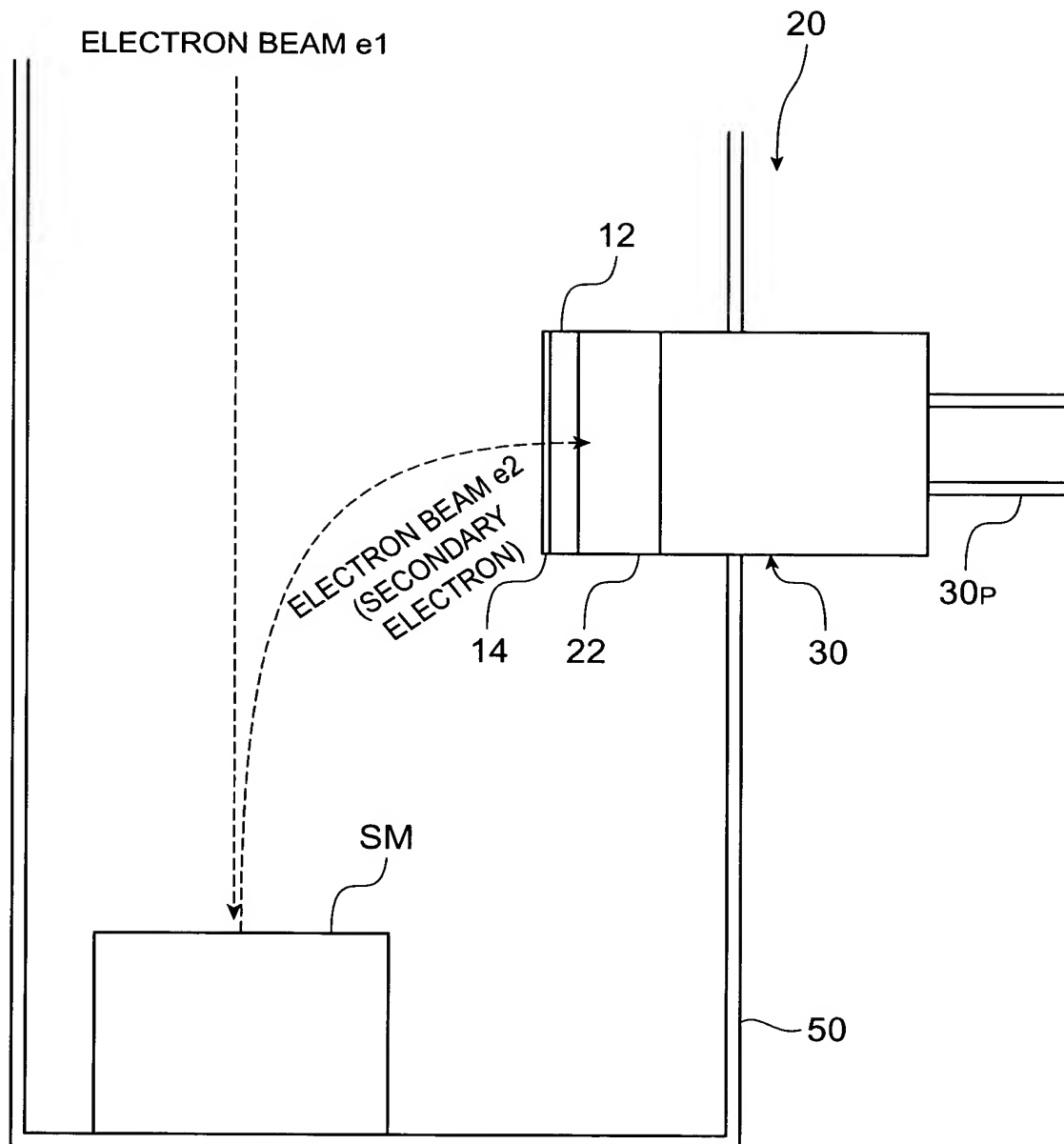
Fig. 22

Fig. 23

